Brains on wheels – theoretical and ethical issues in bio-robotics

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Almost all current robots and probably most robots to occur in the near future are and will be computer based. However, robots based on biological neuron cultures grown *in vitro* are being developed and studied. Kevin Warwick's group at University of Reading have been hooking cultured neurons from rat fetuses to remote controlled cars in effect creating cyborgs with bodies, senses and biological brains, (Warwick et alt., 2010). Although rather primitive at present, among other things due to the fact that these neuron cultures are rather small (about 100,000 neurons - a mature rat has about 200,000,000 neurons) and short-lived (about three months), the prospects are daunting. Technological advances within the area could make it possible to grow brains of a size comparable to or exceeding that of the human brain (about 85,000,000,000 neurons) and, thus, it is hoped, making robots packing cognitive power comparable to or exceeding that of a mature human being. Here we might have both a short cut to the singularity, the point where artificial intelligence surpasses human intelligence and a potential avenue for life beyond the biological brain, should the researchers e.g. succeed in transferring a neuron culture from one medium to another.

Whatever excitement these prospects may arouse, there are some issues which are seemingly downplayed a bit within this emerging community, some being of a theoretical nature and some being of an ethical nature. This paper aims at taking a critical look at these issues from a philosophical point of view. Among the theoretical issues is the uncertainty surrounding which principles actually govern the growth and networking of neurons (grown outside the brain or not). Research shows, for instance, that cultured neurons network spontaneously, forming so-called *small worlds*, which are networks considered optimal for information processing (see Downes et alt., 2012). However, whereas the authors consider this phenomenon an indication of complex, intrinsic biological mechanisms, it is not at present clear what these mechanisms consist in, or to put it differently, words like *spontaneously* and *intrinsic mechanisms* can come to serve as a cover for lack of insight into the phenomenon of network growth. A related problem, pointed out with regard to robots with biological brains is that researchers know very little about what these neuron cultures consider to be rewards and punishments, see (Warwick, 2012). There seems to be a certain risk involved in releasing cyborgs grown according to principles we are only beginning to understand and motivated by factors we do not know. What are the dangers of such creatures for us, should they for instance learn how to multiply? Could they turn out to be carriers of dangerous diseases?

Further, there are number of ethical issues which the researchers seem to be taking a bit lightly at present. If these robots are conscious, as Warwick seems to argue, is it then ethically defensible to create them at all, as they only have a very short life span? How does it feel to have a remote controlled car as a body, does that create new forms of existential anxieties? How does this research compare with research with biological rats – is it nothing more or does the seeming purpose of creating human-scale intelligence put ethical constraints on researching even these rudimentary cyborgs? Should this research succeed what will be the function of these robots in society? Is it ethically defensible to design such advanced creatures with a specific function, or does the possession of human-scale intelligence and conscious awareness imply a right to the search for a personal purpose beyond the intentions of any designer, human or otherwise?

In this paper I try to answer some of these questions by invoking perspectives from theory of science and ethics.

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